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Price Expectations in Experimental Asset Markets with Futures Contracting

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I. Introduction

A financial bubble is defined as a condition in which the trading price of an asset is above (and increasing relative to) its discounted present value of earnings, i.e., its fundamental value. Consider the data in Figure 1 where an asset was traded over 15 consecutive trading periods. In the figure, we plot the deviation in mean contract price from the net asset value (NAV) of the security for each of the trading periods. Notice that the price grows steadily, peaks, and then "crashes" to its NAV. There is a puzzle concerning the level of premiums and discounts from NAV for closed-end funds, which provides a challenge to a rational expectations theory of asset pricing, since the data in Figure 1 was generated from an experiment in which the fundamental value of the asset was controlled. There were no external market factors to justify the deviation from fundamental value other than the capital gains expectation of the participants (see Smith, Suchanek and Williams [1988] hereafter referred to as SSW). The phenomena describe in Figure 1 is a very standard outcome of a specific experimental asset market that has been replicated over 70 times with diverse subject pools.

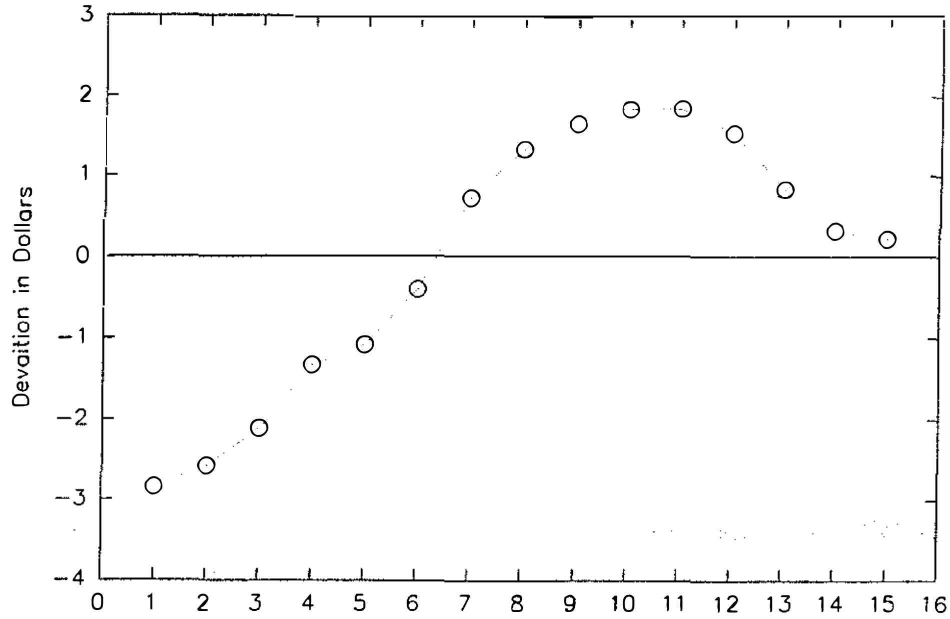


Figure 1. Asset Trading Price Deviation from NAV

With closed-end funds, Lee, Shleifer and Thaler [1991] suggest that deviations from NAV not attributable to agency costs, tax liabilities and illiquidity can be explained by investor sentiment. In particular, all traders may not be rational investors; thus with risk averse traders, the equilibrium price reflects the opinions of both rational and noise traders. In asset market experiments, any semblance of noise trading is eliminated by experience. That is, traders who are twice experienced in an asset market will contract only at prices that closely track fundamental value. For example, Figure 2 shows the contract prices for the traders who previously experienced the bubble in Figure 1. Thus, while bubbles almost always occur with inexperienced traders, bubbles are dampened with experienced traders and never reoccurs with twice experienced subjects.

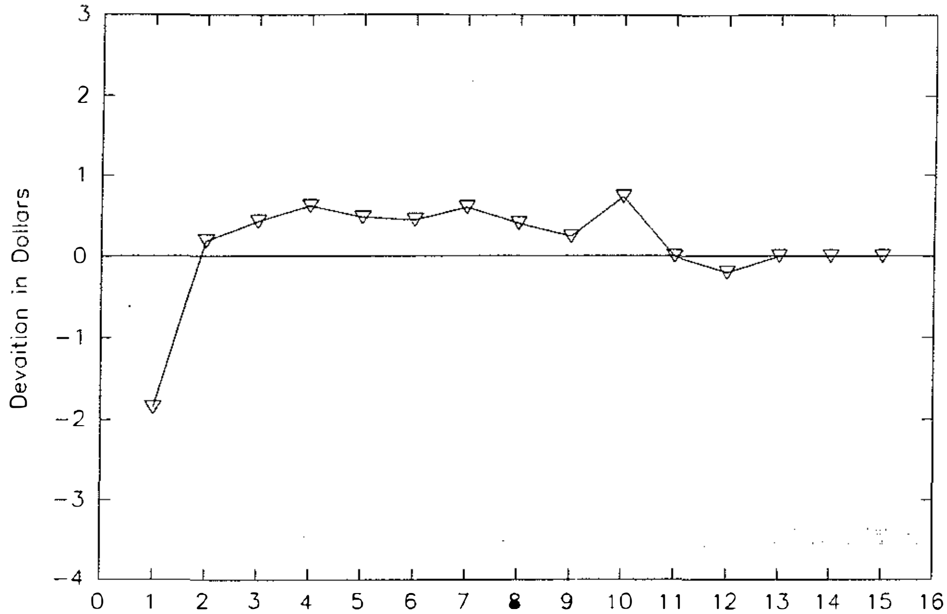


Figure 2. Asset Trading Price Deviation from NAV

Experienced Traders

Two possible explanations for the existence of bubbles in laboratory asset markets concern the expectations formation of traders and the market structure under which they operate. Recently, Caginalp and Ermentrout [1990a,b], have proposed a differential equation model of investor behavior. The model assumes a kinetic reaction among investors that relies on a fundamental value component ζ_2, and an "emotional" component ζ_1. The later is based on a memory of price history that decays in time, and which captures the tendencies among investors to buy in a recently rising market and sell in a recently declining market.

Given that each unit of asset is either in cash, stock, or in a transition from stock to cash (stock submitted for sale) or cash to stock (buy order placed for a stock), rate equations can be established for these variables as function stock price changes. The transition equations along with the investor sentiment component (ζ_1, ζ_2) equations, can be manipulated to obtain a system of differential equations that can be solved numerically which yield a solution to the price path of a stock as a function of several parameters. Using one of the experiments conducted in this paper, Caginalp and Balenovich [1991] (BC) obtain estimates for two parameters in the price change equation. Given the parameter estimates the price path for any experiment can then be determined solely from the intrinsic value of the security and the opening price.

Figure 3 shows their estimate for the market described in Figure 1. They find that they can estimate the timing of a peak with approximately an error of 5%, for all the laboratory asset market data in their sample. While the formulation developed by BC does seem to agree closely with the data from laboratory stock markets, it does not have anything to say about how different market structures or market experience can affect the time path. The purpose of this paper is to investigate changes in the laboratory asset market experiments that a priori should have an effect on the time path of prices. We do not test any specific theories concerning price formation in asset markets. That is, the experiments conducted in this paper investigate the impact of changing the fundamental value of component to a limiting case and providing a market instrument to allow traders to obtain estimates of investor sentiment. Neither of the changes provide a direct test of theories concerning price formation with closed-end funds. These experiments only investigate the effect of specific structural changes in the SSW market and their empirical consequences.

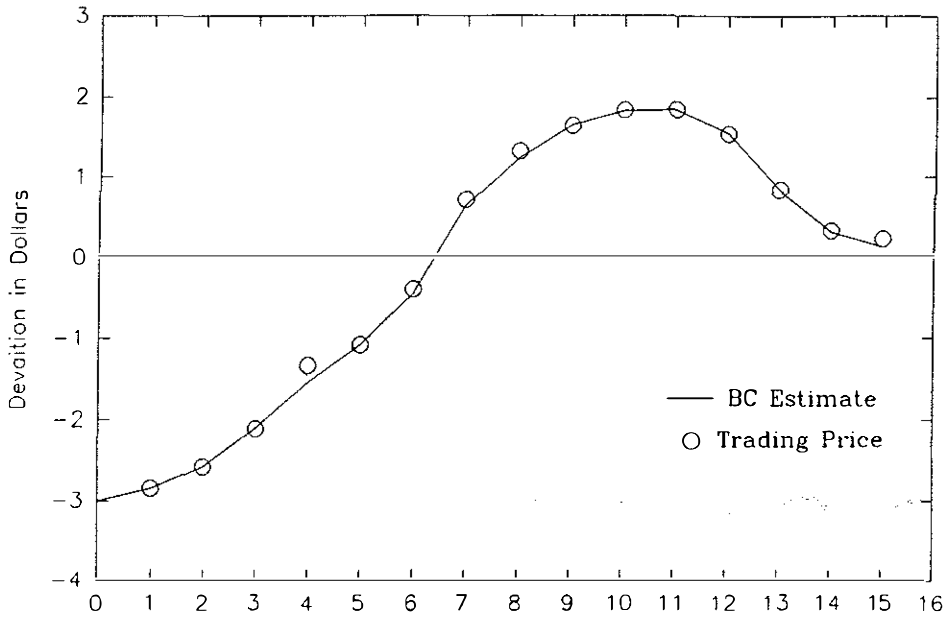


Figure 3. Asset Trading Price Deviation from NAV

Recently, King, et al [1992] checked for the robustness of the laboratory bubble phenomena by looking at a variety of changes in the asset market structure. They allowed margin buying, introduced informed insiders into the market, permitted limited short-selling, added brokerage fees and imposed limit price change rules. None of these changes reduced the severity of the bubble and in some cases (margin buying and limit price change rules) exacerbated the bubble. Along these same lines, we introduce two changes in these asset markets that presumably allow investors to update their expectations and reduce the "investor sentiment" effect on price formation. In the laboratory asset market, intrinsic value of the asset is determined from the dividend income it produces. Dividends are paid at the end of each period and are determined by a draw from a fixed and known distribution. The asset has a dividend life of fifteen periods at which time the experiment ends. Investors in this environment can buy and sell the asset each period in a spot market. In our experiments we changed the market in two ways. First, in order to provide information on future price expectations we add a futures market instrument so that simultaneous spot and futures markets for the asset are operating. The futures should supply investors with a "clear" reading on future period asset value. Second, in order to reduce the effect of possible noise traders, we eliminate any risk aversion, due to the intrinsic value of the asset, by having the dividend draw known and fixed for each period. By eliminating dividend uncertainty investors need not anticipate the dividend draw or the inability of others to assess compound probabilities.

Thus, our research questions are clear; (1) can the introduction of a futures market assist investors in obtaining better price expectations and reduce price bubbles, and (2) is the major determinant of the price bubble the uncertainty of the dividend structure and its effect on noise traders?

II. Experimental Design

Our design consists of the baseline SSW asset market structure, an asset market with a single futures market and an asset market with dividend certainty.

A. Baseline Asset Market

The asset was traded in a double auction[1] market that had the following characteristics which were provided to all participants as common information:

[1] This is a real-time continuous process in which traders submit bids and asks with thespread determined by a standard bid-ask improvement rule.

i) The asset had a finite life of 15 periods and expired worthless at the end of the experiment.

ii) At the end of every period each share of the asset would earn a dividend based on a draw from the distribution given in Table 1.

Table 1. Dividend Structure of the Security

Dividend in Cents	Probability of Occurance
0	.25
8	.25
28	.25
60	.25

Thus, it was common information that the dividend was the same for all participants and a dividend draw would be made at the end of each period to determine the dividend income for the period. The dividend income from a participants' inventory of shares was added to his/her cash position at the end of each period. Participants in this market could buy and sell units of the security during each trading period, provided they had sufficient units in their inventory to make the sale, or sufficient cash in their account to purchase the share.

Therefore, the **fundamental value** of the asset in this market should start at \$3.60 (\$.24 x 15 periods) and decline by \$.24 each period until period 15 as shown in Figure 4. All participants were informed of this declining cumulative value. Specifically, at the beginning of every period, subjects were provided with a table describing the maximum, minimum, and expected dividend value of a share of stock if it were held from the current period until the end of the experiment. In addition, subjects were given information concerning the expected value of their current portfolio of shares and cash if they held their current position. At the beginning of the experiment a trader would be endowed with a portfolio of cash and shares. Three possible initial portfolio types were assigned to traders in our market (see Table 2). In addition, in several baseline experiments margin buying was allowed, i.e., traders were given an interest-free loan of cash at the beginning of the experiment to enhance their cash position; the loan was to be paid back in full at the end of the experiment.

Table 2. Initial Trader Portfolios

Portfolio Type	Initial Stock	Initial Cash	Margin Account*	Expected Earnings
1	1 unit	$9.45	$5.00	$13.05
2	2 units	$5.85	$5.00	$13.05
3	3 units	$2.25	$5.00	$13.05

* Must be repaid at the end of the experiment.

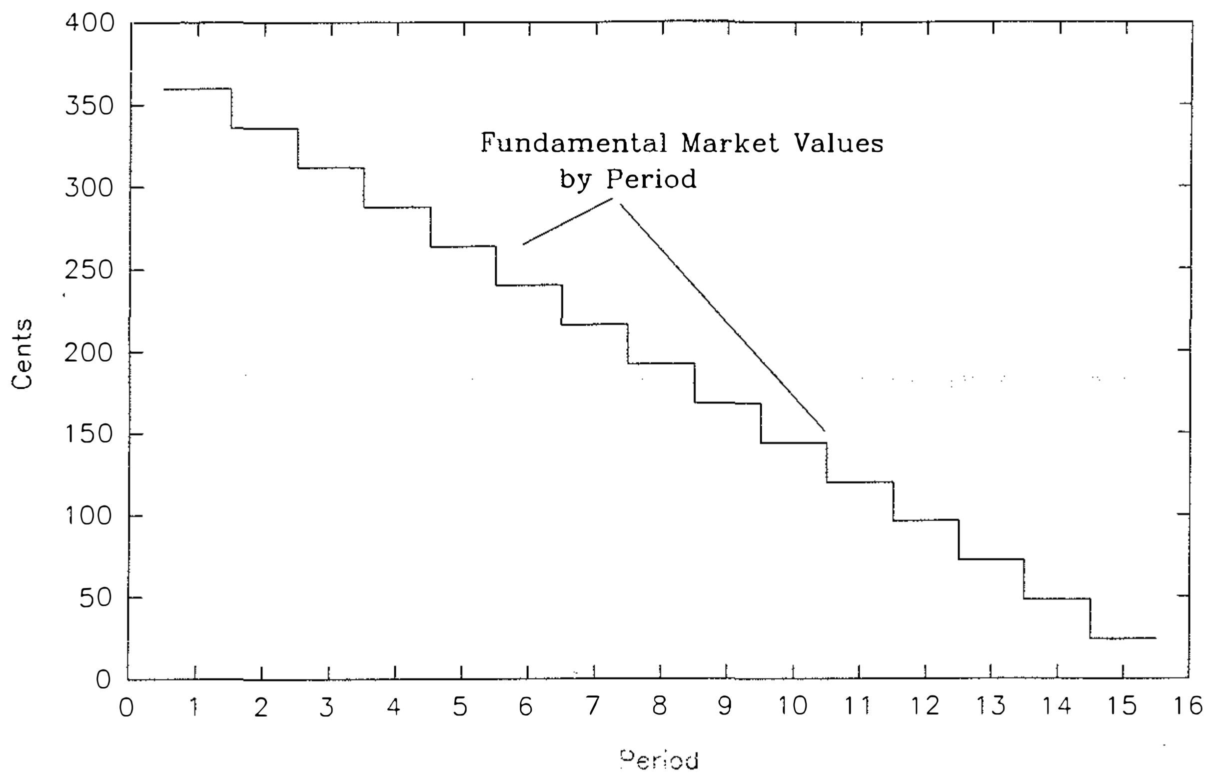


Figure 4. Underlying Fundamental Security Values

B. Futures Market Treatment

Each trader, in addition to his "spot" inventory of securities, was given a capacity to trade units of future shares that would come due at the end of the eighth period of trading. Thus, stock futures would not earn any dividend income until after period 8 when the futures market was closed and all positions were cleared (a trader's net futures position was transferred to his spot holdings at the end of period 8).[2] Thus, the spot and futures instruments represent the same security during the 8th period of trading. We also provided

[2] Operationally, if a trader accumulated net units in his futures inventory above his initial capacity (at the end of period 8), then those added units would be transferred to the trader's spot inventory to be used for trading and dividend income for the remainder of the experiment. If the trader had fewer units in his futures inventory than his initial capacity, then he had to cover the shortfall from units in his spot inventory. In effect, spot shares are delivered against a trader's net futures contracts. In the event that a trader could not cover his futures position with his spot inventory, he would pay a $4.00 per share penalty.

margin funds to traders so that there would not be a liquidity problem in futures/spot trading.

A trader in this market could make bids, asks and contracts in both a spot (periods 1-15) and futures market (periods 1-8). Since a futures contract converts to a spot share that can only earn dividends from period 8 to period 15, the fundamental value of a futures contract is $1.92 (see Figure 5). The futures market in this environment supplies an advance reading on expectations of share value in period 8. Table 3 supplies an updated table of the portfolio types used in our futures experiment.

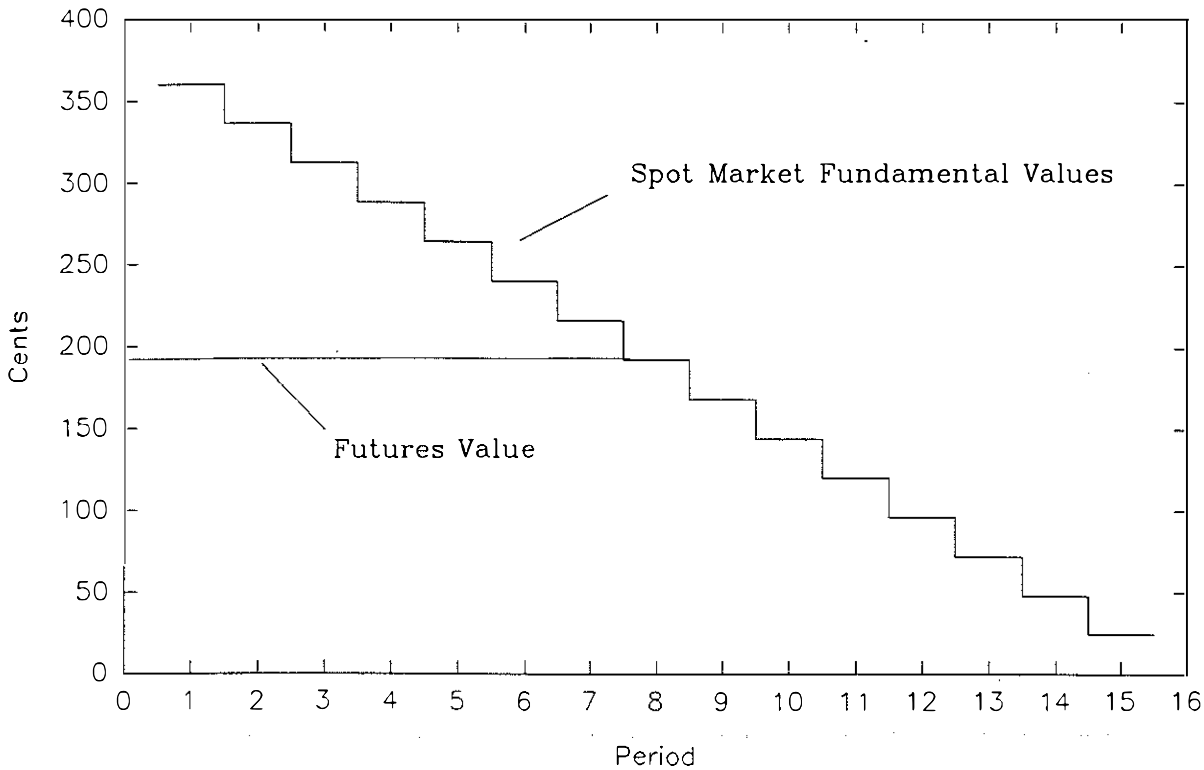


Figure 5. Spot and Futures Market Underlying Fundamental Security Values

Table 3. Initial Portfolio Conditions for Futures Treatment

Portfolio Type	Initial Spot Inventory	Futures Capacity*	Initial Cash	Margin Account
1	1 unit	3 units	$9.45	$10.00
2	2 units	2 units	$5.85	$10.00
3	3 units	1 unit	$2.25	$10.00

*Spot plus Futures inventories at end of period 8 must be greater than zero or a $4.00 per share penalty must be paid.

C. Dividend Certainty Treatment

This treatment changes the baseline distribution of dividend draws to a distribution in which all the probability mass is at $.24. That is, there is no uncertainty concerning the value of the dividend income derived from the security. Hence, if trader uncertainty about price expectations is due to dividend uncertainty, then we should find that this treatment reduces the severity of a bubble.

D. Computer Trading Network

The experiments employed for this study used two different computer networks and software designs. Most of the baseline experiments used the PLATO system while all of the futures treatments used a local area network (LAN).[3]

[3] The LAN was used because the software allows for multiple market simultaneous trading which is required to conduct a spot and futures market (see Johnson, et al, 1990). Our database contains ten baseline asset market experiments using LAN.

III. Experimental Procedures

In each experiment we conducted, the initial assignment of portfolio types was symmetric; that is an equal number of agents were assigned to each portfolio type.[4] In the futures market treatment, subjects were first trained in a series of independent two-period securities market with a futures contract coming due at the end of each second period. This allowed subjects to become familiar with the accounting procedures for a futures market, without exposing them to a bubble condition. Because there was a possibility of losses in the 15 period futures market experiments, subjects were recruited with the understanding that they would be in two experiments during the week and their earnings would be the total from the two experiments. A "bankruptcy" condition was never encountered in any of our experiments.

To date, in the laboratory, trader experience has been the only major factor identified in eliminating bubbles. In King, et al, this experience means that traders were in a security market previously with the same subjects, i.e., they experienced the same initial phenomena together. Thus, in our experiments, care was taken to make sure that the same subjects in an experiment returned for the second and subsequent experiments. Table 4 supplies a list of the pertinent facts for each experiment we conducted.

[4] If the number of subjects was not divisible by 3, any remainders would be added to the type 2 portfolios so the average number of spot and futures shares per trader was 2.

Table 4. List of Experiments*

Treatment	Subject Pool	Experienced	Total Stock	Trading System	Time**
Futures	Arizona	No	18	LAN	300
Futures	Arizona	No	18	LAN	300
Futures	Arizona	No	18	LAN	300
Futures	Arizona	Yes	16	LAN	300
Futures	Arizona	Yes	18	LAN	300
Certain	Arizona	No	22	LAN	240
Certain	Arizona	Yes	18	LAN	240
Certain	Arizona	No	22	LAN	240
Certain	Indiana	No	18	PLATO	240
Certain	Arizona	Yes	16	LAN	240
Certain	Indiana	Yes	16	PLATO	240
Switch***	Arizona	Yes	16	LAN	240
Switch	Indiana	Yes	16	Plato	240

* In addition to the experiments listed above, we use 17 baseline experiments from the University of Arizona Database of asset market experiments. The database consists of 8 PLATO inexperienced experiments, 2 PLATO once-experienced experiments, 2 PLATO inexperienced with margin buying, and 7 LAN baseline experiments.
** Market period trading length in seconds.
***This treatment used subjects that were twice experienced in the certain dividend market and put them in the baseline treatment where dividends were uncertain.

IV. Experimental Results

The futures market and certain dividend treatments will be analyzed in terms of their relative effects on price amplitudes, duration, and stock turnover from the baseline. Specifically, an ANOVA model of the treatments of the experiments in our sample was undertaken. We estimate a dummy variable regression model with each of the treatment variables along with the interaction of experience on the treatments from the baseline experiments (see Appendix A). Given the estimates of this model we then test to see if any of the treatment variables are different from the baseline case. Since we are making multiple comparisons on the same data set, we employ the Bonferonni joint hypothesis test (see Miller [1981]).

A. Measurement Variables

We focus our attention on the following empirical properties of bubbles.

(i) **Duration:** the number of periods in which there is an increase in market price relative to fundamental value. This number represents the maximum number of periods in which a trader could purchase the asset and ensure a positive expected value bet. Specifically, if f_t is fundamental value in period t and P_t is the mean spot price, then duration d is defined as:

$$d = \max \{ m: P_t - f_t > P_{t-1} - f_{t-1} > \ldots > P_{t-m} - f_{t-m} \}$$

(ii) **Turnover:** The total volume of trade divided by the outstanding capital stock. This number is a normalized index of trading activity. A large turnover implies a churning of the market.

(iii) **Amplitude:** This measures the "overvaluation" of the asset relative to fundamental value. Formally, amplitude (a) is given by

$$a = \max\{P_t - f_t : t = 1,\ldots,15\} - \min\{P_t - f_t : t=1,\ldots,15\}$$

B. Treatment Effects

Table 5 shows the summary statistics of the treatment effects on the measurement variables discussed earlier. Tables 6 through 8 provide the p-values from the Bonferonni t-test of the multiple comparisons from each of the treatments in our data series (the time series of the data can be found in Appendix B). The p-values from these tables show:[5]

[5] Although not listed in tables, the LAN system has significantly higher trading volume (turnover).

1. Independent of experience, a futures market significantly reduces bubble amplitude. In addition, duration and turnover are reduced, but not significantly.
2. The elimination of dividend uncertainty has no significant effect on the bubble characteristics. However, once subjects are once experienced in the market with a certain dividend, amplitude and turnover are significantly reduced relative to the uncertain dividend case.
3. Once traders are twice-experienced in the certain dividend environment, adding uncertainty to the dividend structure does not rekindle a price bubble.
4. The use of margin buying significantly increases amplitude and turnover with inexperienced traders.

Thus, we have uncovered two very important facts from these experiments. A futures market does not entirely eliminate bubbles, but it does have an ameliorating effect on bubble amplitude. On the other hand, dividend uncertainty provides little explanation for the occurrence of bubbles in these asset markets. Notice that we have only one futures in our market; the period 8 futures. An open question is whether a complete set of futures markets (one for each period) or options would dampen bubbles even more.

C. Analysis of Futures Prices

Recall, in period 8 of our futures market experiments, a spot and futures contract are identical. Thus, we would expect very little difference between the period 8 spot and futures contract prices. In most experiments, the mean spot and futures prices in period 8 are almost identical. The pooled mean contract price for a futures contract was 226.1 with a standard deviation of 95.7, while the pooled mean spot contract price for period 8 was 226.4 with a standard deviation of 66.7. The relationship between spot and futures prices will of course depend on the expectations of traders of price conditions in period 8. If the asset were to trade at fundamental value we would expect to see the spot contracts trading at a $1.68 premium over futures contracts in period 1 and decline by $.24 each period until the futures contracts are called. Figure 6 shows the difference between the spot and futures prices for each period in our experiments. There seems to be no discernible pattern in this data.

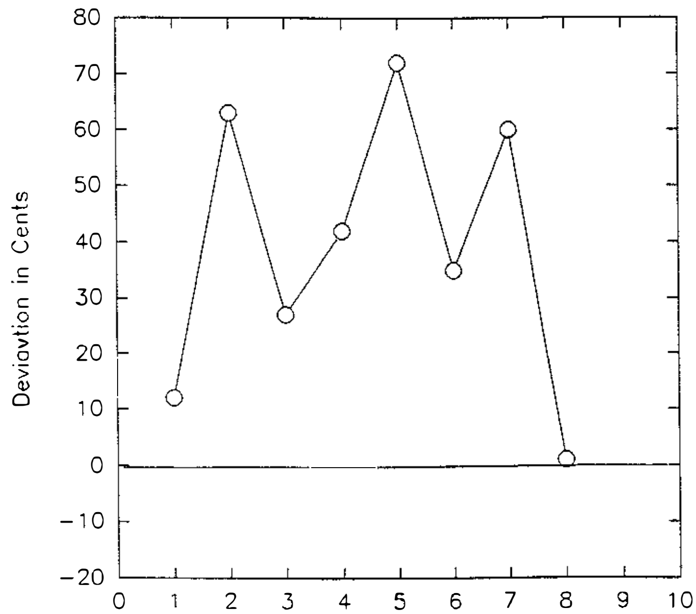


Figure 6. Mean Deviation of Closing Prices Spot - Futures (Pooled)

Table 5. Summary Statistics by Treatment
(mean values)

TREATMENT	INEXPERIENCED amplitude	INEXPERIENCED duration	INEXPERIENCED turnover	ONCE EXPERIENCED amplitude	ONCE EXPERIENCED duration	ONCE EXPERIENCED turnover
Baseline	1.29	9.65	6.53	.85	6.82	2.49
Futures	.92	10.00	6.85	.60	5.5	2.63
Certain Dividend	1.09	11.00	8.85	.52	9.7	2.71
Margin Buying	3.21	10.00	5.40	1.12	6.5	4.61
Switch	na	na	na	.40	4.5	2.59

Table 6. Bonferonni Join Hypotheses Test for Amplitude*
(p-values)

TREATMENTS:	BASELINE No Experience	BASELINE Once Experienced
FUTURES CONTRACTS		
No Experience	.11	na
Once Experienced	na	.19
CERTAIN DIVIDEND		
No Experienced	.98	na
Once Experienced	na	.17
Switch	na	.12

*The null is that the row treatment equal the baseline and the alternative is that the row treatment and column are not equal.

Table 7. Bonferonni Join Hypotheses Test for Duration
(p-values)

	BASELINE	
	No Experience	Once Experienced
TREATMENTS:		
FUTURES CONTRACTS		
No Experience	.73	na
Once Experienced	na	.60
CERTAIN DIVIDEND		
No Experienced	.65	na
Once Experienced	na	.24
Switch	na	.35

Table 8. Bonferonni Join Hypotheses Test for Turnover
(p-values)

	BASELINE	
	No Experience	Once Experienced
TREATMENTS:		
FUTURES CONTRACTS		
No Experience	.81	na
Once Experienced	na	.50
CERTAIN DIVIDEND		
No Experienced	.13	na
Once Experienced	na	.09
Switch	na	.24

D. Walrasian Price Changes

SSW develop a statistical model to characterized the period to period mean changes in contract prices. The predication equation that they use is:

$$P_t - P_{t-1} = a + b\,(B_{t-1} - O_{t-1}) + e_{t-1}$$

where P_t is the mean contract price in period t, B_t is the number of bids tendered in period t, and O_t is the number of asks submitted in period t.

The above equation uses the level of excess bids as a proxy for the excess demand for shares arising from endogenous capital gains expectations. One hypothesis derived from this model by SSW is that the coefficient a should be equal to minus the expected dividend of $.24 (if agents are risk neutral) with b>0 if traders have capital gains expectations. SSW report that in all except one of their bubble-crash experiments b is significantly greater than 0 and a does not differ significantly from expected dividend income.

We estimated equation 1 for both the certain dividend and futures market treatments. Table 9 summarizes the results of the regressions and shows that in all cases a = -.24 <u>cannot</u> be rejected and b = 0 <u>can</u> be rejected (one-tailed test). These results are consistent with those found in SSW. However, the excess bid coefficient b for the futures market is smaller than the estimates provided by SSW.

Table 9. Walrasian Price Adjustment Estimates

TREATMENT:	a	b	R^2
FUTURES MARKET			
Inexperienced	-.141 (.59)	.0191 (4.1)	.35
Experienced	-.215 (.27)	.004 (3.7)	.47
CERTAIN DIVIDEND			
Inexperienced	-.10 (.71)	.027 (2.1)	.21
Experienced	-.19 (.60)	.011 (4.4)	.24

* t-values are in parenthesis for the hypothesis of a=-.24 and b=0

V. Conclusions

When laboratory asset markets are populated by inexperienced traders, a boom and bust pattern of asset prices is a natural phenomena. This pattern continues to occur even if all uncertainty concerning intrinsic dividend value is eliminated. Thus, appeals to risk aversion and confusion in calculating compound probabilities (noise trading) as reasons for boom and bust patterns is not supported. Indeed, once traders are experienced in the trading of a certain dividend value assets, a bubble does not manifest itself if the dividend is made uncertain. The most significant variable, to date, in eliminating price bubbles in laboratory asset markets, has been experience. This result seems to be robust against many different institutional changes such as short-selling, margin buying, subject pools, limit price change rules (see King, et al (1992)). Consequently, common information concerning intrinsic stock value is not sufficient to induce common expectations concerning asset price.

Nonetheless, the addition of a futures market does have a significant effect on the amplitude of price bubbles relative to inexperienced and experienced traders. This suggests that institutional changes that provide market information on price information in future periods can mitigate the effects of "homegrown" capital gains (losses) expectations that seem to drive laboratory asset market prices. Thus, the important function of futures contracting is to hasten the formaion of common expectations. In individual decision-making experiments, in which backward induction leads to optimal decsions, expectations formation seems not to effect the predicted outcomes. However, when goup expectations plays a prominent role in price determination, institutions are required assist in this backward induction process. Futures contracting, in laboratory asset markets, plays an important role in this process.

APPENDIX A

ANOVA Estimates of Treatments

The following estimates are from an *ordinary least squares* regression of the treatment dummies on the measurement variables: amplitude, duration, and turnover.

Equation 1
Dependent variable: **AMPLITUDE**

Valid Cases:	44	Missing cases:	0
Total SS:	35.6574	Degrees of freedom:	40
Residual SS:	12.9871	Std error of est:	0.3545
		Log-Likelihood:	-38.7890

Treatment	Coefficient	Std. Error	t-Statistic	P-Value
Certain Dividend	0.0626	0.2530	0.2472	0.8055
Futures	-0.6796	0.3800	-1.7884	0.0782
Margin Buying	0.8375	0.2505	3.3438	0.0013
Local Area Net	0.8843	0.2452	3.6009	0.1138
Switch	0.5073	0.2824	1.1037	0.2737
Inexperienced	1.3602	0.1154	11.7849	0.0000
Once Experienced	0.7889	0.1624	4.8568	0.0000
Twice Experienced	0.1680	0.2267	0.7410	0.4613

Equation 2
Dependent variable: **DURATION**

Valid Cases:	44	Missing cases:	0
Total SS:	834.0231	Degrees of freedom:	40
Residual SS:	402.3870	Std error of est:	1.9754
		Log-Likelihood:	-157.0030

Treatment	Coefficient	Std. Error	t-Statistic	P-Value
Certain Dividend	2.7896	1.3175	2.1174	0.0379
Futures	-0.3107	1.9785	-0.1571	0.8757
Margin Buying	0.4967	1.3042	0.3808	0.7045
Local Area Net	0.2801	1.0210	0.2743	0.7847
Switch	1.9328	2.2638	0.8538	0.3963
Inexperienced	9.2417	0.6010	15.3779	0.0000
Once Experienced	5.4722	0.8457	6.4706	0.0000
Twice Experienced	2.4272	1.1802	2.0567	0.0436

Equation 3
Dependent variable: **TURNOVER**

Valid Cases:	44	Missing cases:	0
Total SS:	568.1284	Degrees of freedom:	40
Residual SS:	209.2946	Std error of est:	1.7674
		Log-Likelihood:	-153.3804

Treatment	Coefficient	Std. Error	t-Statistic	P-Value
Certain Dividend	-0.7395	0.8675	-0.8525	0.3969
Futures	-2.7666	1.3027	-2.1237	0.0374
Margin Buying	-0.1470	1.8587	-0.1712	0.8646
Local Area Net	3.8932	0.6723	5.7909	0.0000
Switch	-0.9335	1.4906	-0.6263	0.5333
Inexperienced	5.2291	0.3957	13.2150	0.0000
Once Experienced	2.6124	0.5568	4.6916	0.0000
Twice Experienced	1.5769	0.7770	2.0293	0.0464

The following results are based on a ***seemingly unrelated regression*** estimates of the amplitude, duration, and turnover simultaneous equations.

Log-Likelihood: -307.9861

Equation 1
Dependent variable: **AMPLITUDE**

Valid Cases:	44	Missing cases:	0
Total SS:	35.6574	Degrees of freedom:	40
Residual SS:	12.9871	Std error of est:	0.3486

Treatment	Coefficient	Std. Error	t-Statistic	P-Value
Certain Dividend	0.0626	0.2301	0.2718	0.7865
Futures	-0.6796	0.3456	-1.9664	0.0527
Margin Buying	0.8375	0.2278	3.6766	0.0004
Local Area Net	-0.4987	0.3009	1.6573	0.1200
Switch	0.4799	0.3954	1.2135	0.2284
Inexperienced	1.3602	0.1050	12.9578	0.0000
Once Experienced	0.7889	0.1477	5.3402	0.0000
Twice Experienced	0.1680	0.2061	0.8147	0.4176

Equation 2
Dependent variable: **DURATION**

Valid Cases:	44	Missing cases:	0
Total SS:	834.0231	Degrees of freedom:	40
Residual SS:	402.3870	Std error of est:	1.7564

Treatment	Coefficient	Std. Error	t-Statistic	P-Value
Certain Dividend	2.7896	1.1982	2.3281	0.0224
Futures	-0.3107	1.7994	-0.1727	0.8633
Margin Buying	0.4967	1.1861	0.4187	0.6765
Local Area Net	0.2801	0.9286	0.3017	0.7637
Switch	1.9328	2.0589	0.9387	0.3507
Inexperienced	9.2417	0.5466	16.9084	0.0000
Once Experienced	5.4722	0.7692	7.1146	0.0000
Twice Experienced	2.4272	1.0733	2.2613	0.0264

Equation 3
Dependent variable: **TURNOVER**

Valid Cases:	44	Missing cases:	0
Total SS:	568.1284	Degrees of freedom:	40
Residual SS:	209.2946	Std error of est:	1.6074

Treatment	Coefficient	Std. Error	t-Statistic	P-Value
Certain Dividend	-0.7395	0.7889	-0.8525	0.3969
Futures	-2.7666	1.1848	-2.1237	0.0374
Margin Buying	-0.1470	0.7810	-0.1712	0.8646
Local Area Net	3.8932	0.6114	5.7909	0.0000
Switch	-0.9335	1.3556	-0.6886	0.4930
Inexperienced	5.2291	0.3599	14.5302	0.0000
Once Experienced	2.6124	0.5064	5.1585	0.0000
Twice Experienced	1.5769	0.7067	2.2313	0.0284

APPENDIX B

Time Series Data

The following graphs show the mean contract price for each period and experimental treatment. The number associated with each mean contract data point in each graph is the volume of trade for that period.

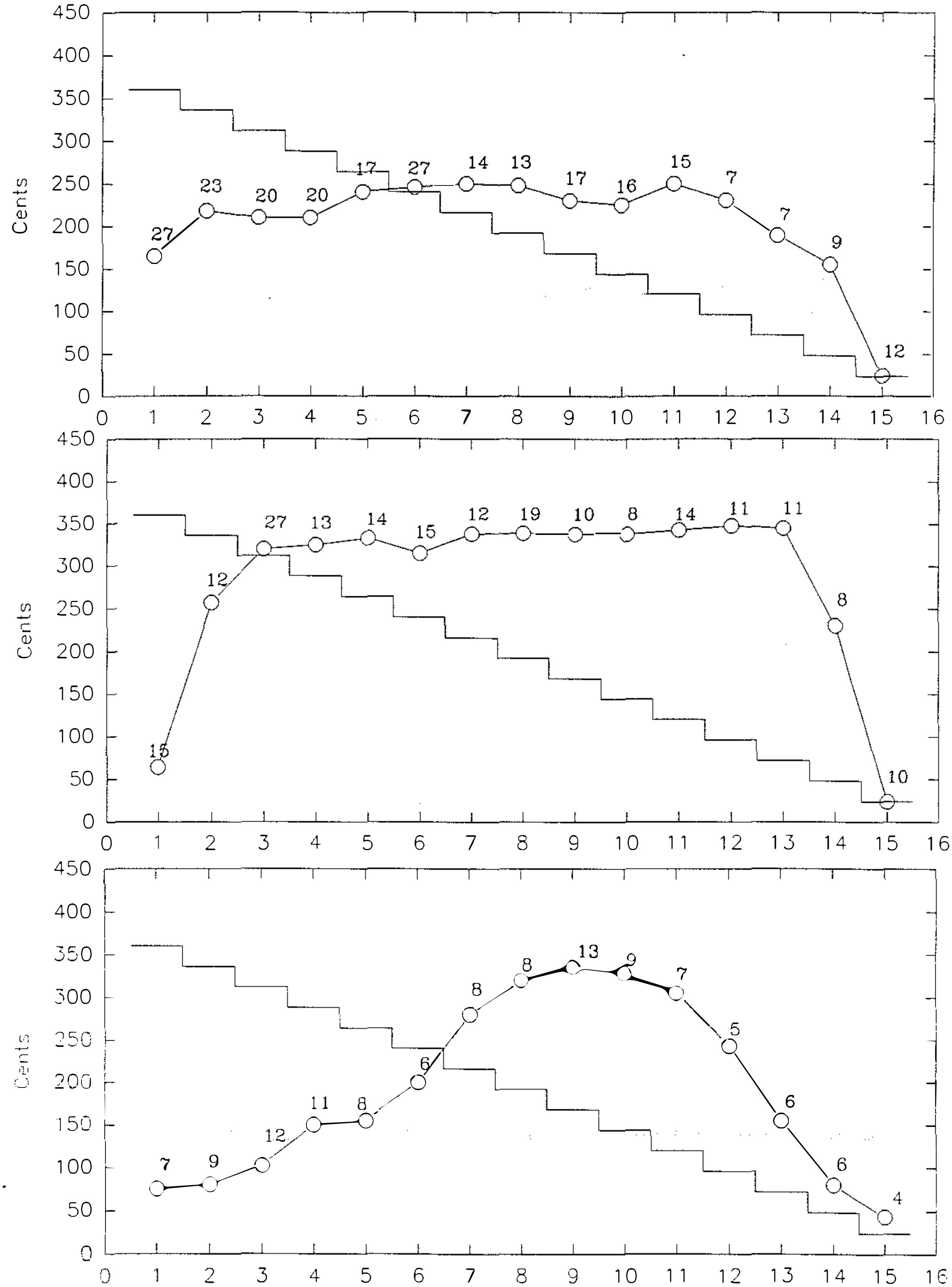


Figure 7. Certain Dividend Inexperienced

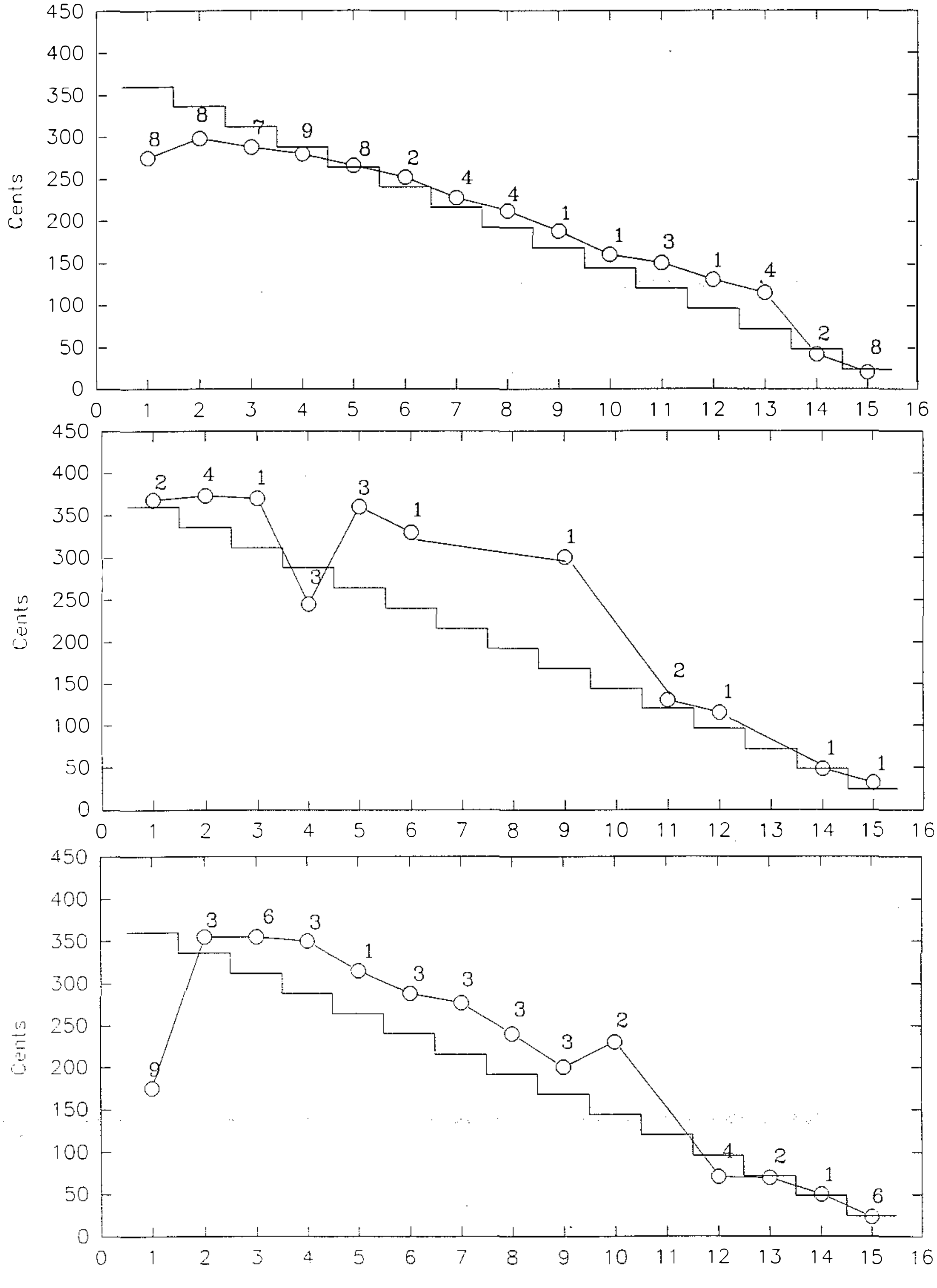


Figure 8. Certain Dividend Experienced

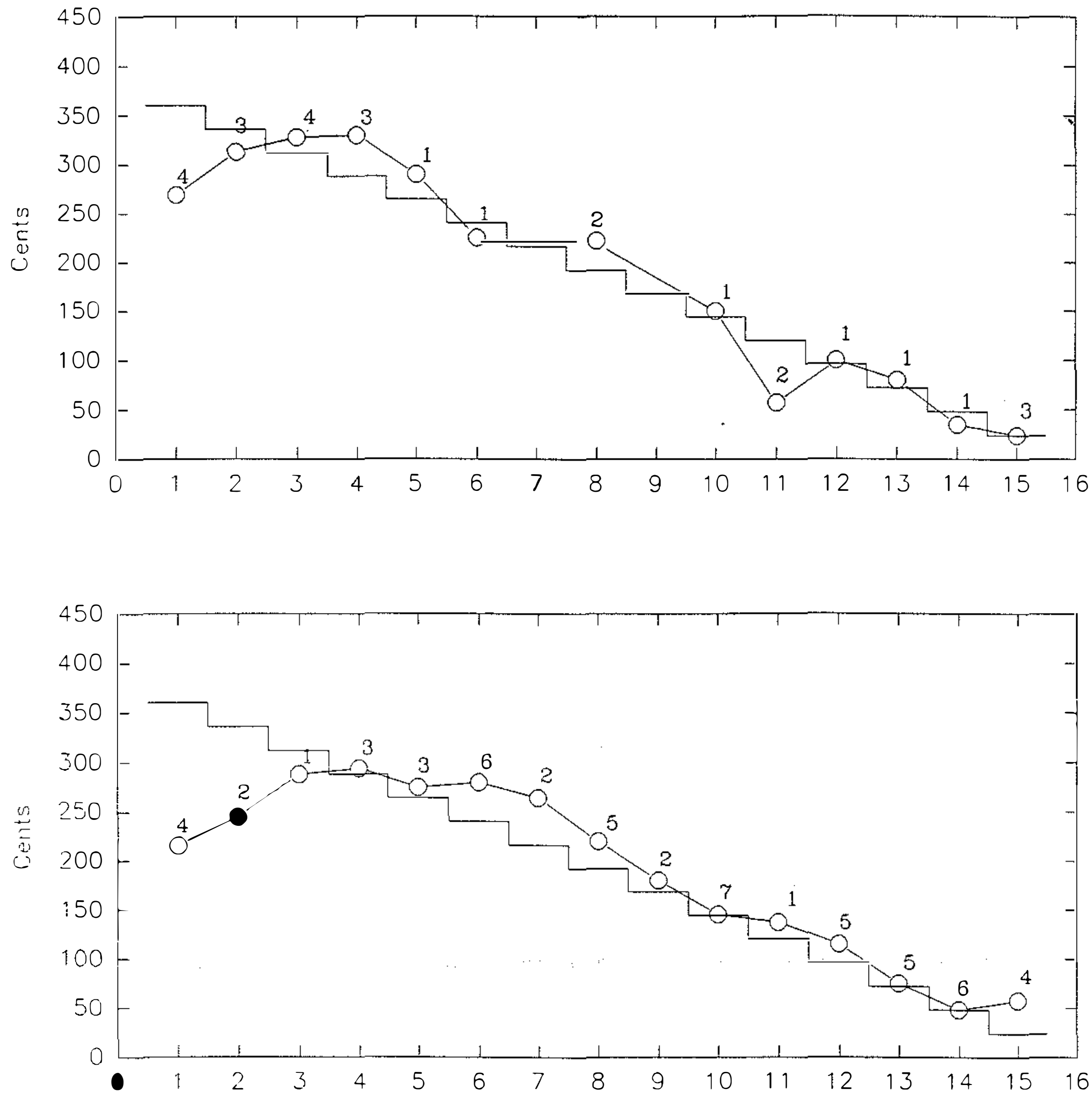


Figure 9. Certain/Uncertain (switch) Dividend

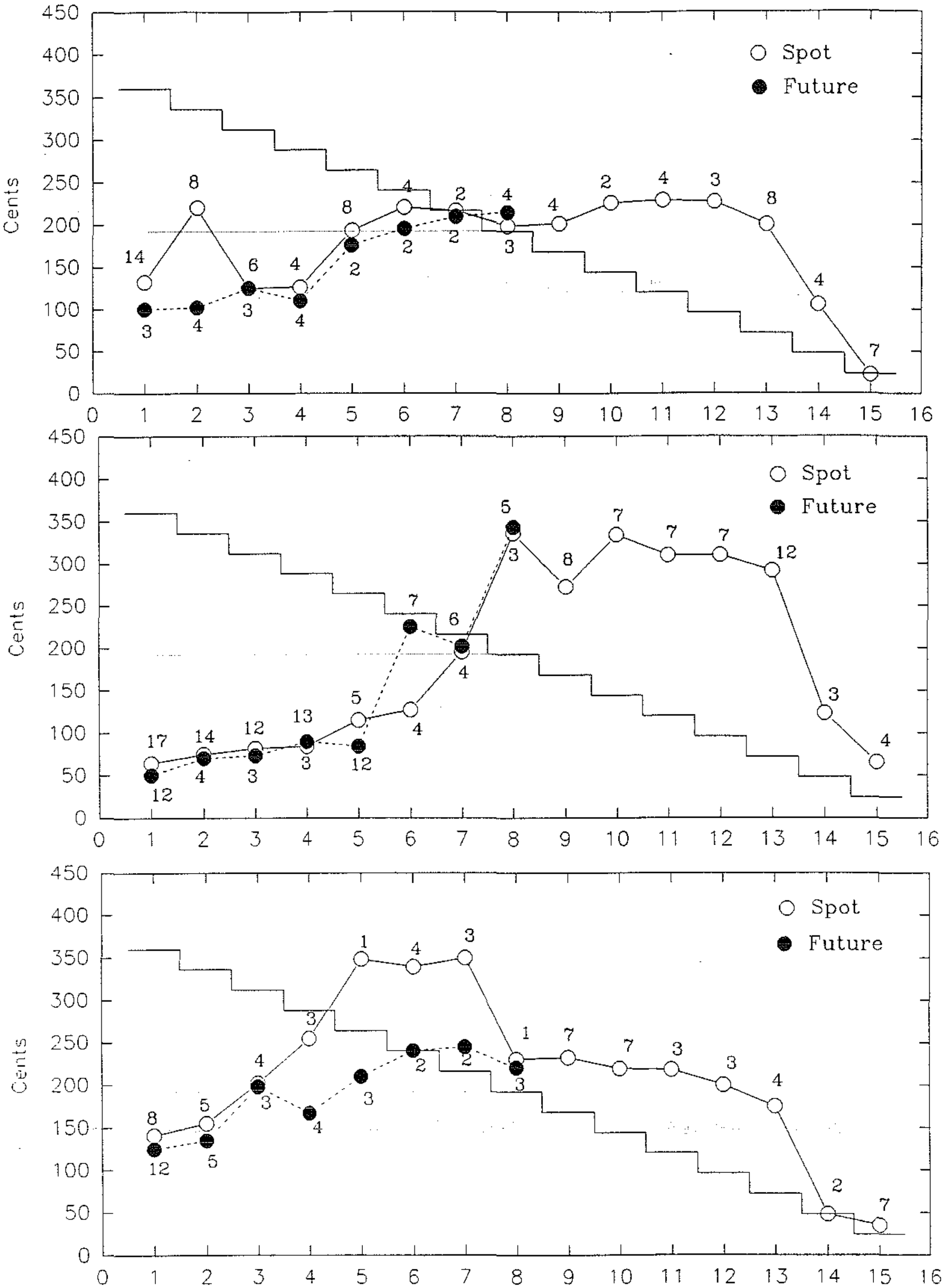
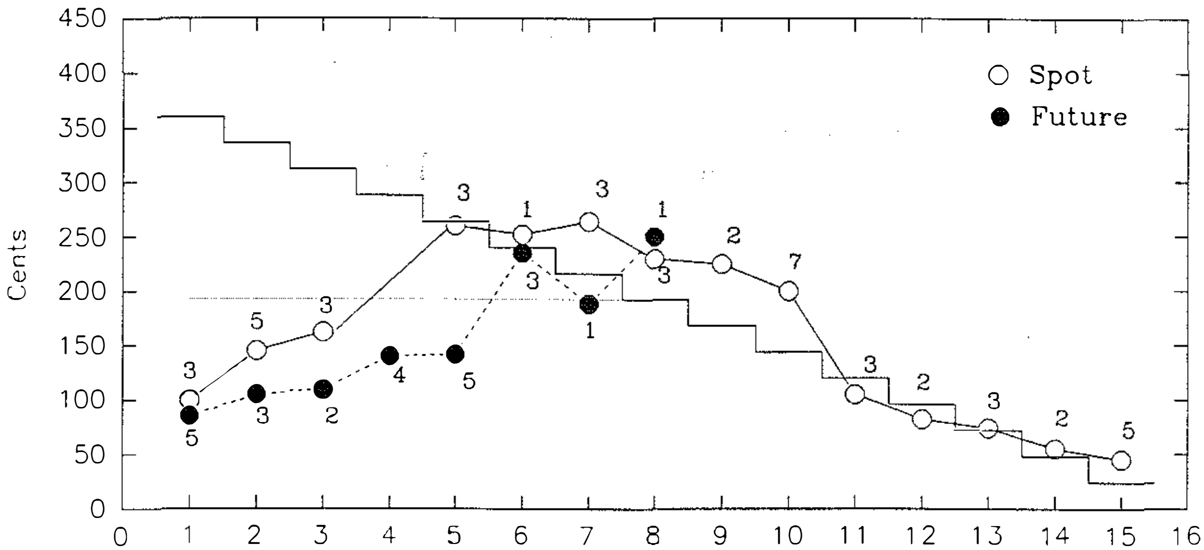


Figure 10. Futures Market Inexperienced



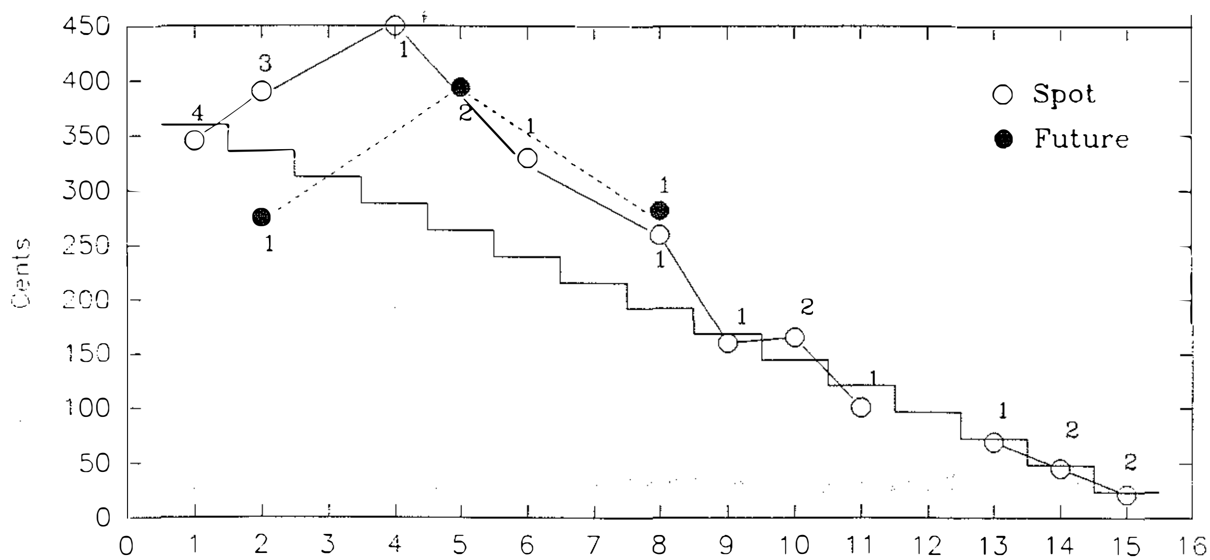


Figure 11. Futures Market Experienced

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